1. OVERVIEW

Subject Area	Biochemistry
Degree	Bachelor's Degree in Biotechnology
School/Faculty	School of Biomedical and Health Sciences
Year	First
ECTS	9 ECTS
Type	Core
Language(s)	Spanish
Delivery Mode	On campus
Semester	First and second semester
Academic Year	2024-2025
Coordinating professor	Elvira Benítez de Gracia
	Cira García de Durango

2. INTRODUCTION

Biochemistry is a compulsory subject worth 9 ECTS and is over the year in the first year of the Bachelor's Degree in Biotechnology. It belongs to the BIOCHEMISTRY AND MOLECULAR BIOLOGY module.

Knowledge of biochemistry is essential for understanding the structural basis of cells and the processes underlying their metabolic functioning. To this end, students will study the main biomolecular structures and how metabolic reactions which occur inside cells are essential to the biological processes which take place during growth and adult life of individuals, both in physiological and pathological situations.

3. LEARNING OUTCOMES (RA, by the acronym in Spanish)

Knowledge (CON, by the acronym in Spanish)

CON02. Recognise the structure, organisation and function of tissues, organs and systems, viruses and cells, as well as the processes which occur in them. Know the scientific principles and biotechnological applications of biochemistry.

- Understand the metabolic processes which make it possible for living beings to function, as well as establishing a relationship between alterations to the metabolic processes and the origin of different pathologies.
- Distinguish biological macromolecules based on their function and structure, as well as the processes in which they intervene.

Abilities (HAB, by the acronym in Spanish)

HAB04. Design experimental procedures and protocols choosing the most suitable technique in the field of biotechnological research, all the while meeting quality and legislative standards.

- Know how to perform experiments and answer questions regarding the different kinetic and regulatory aspects of catalytic activity and the associated underlying mechanisms.

Skills

COMP01. Acquire an integral vision of cellular function and its different behaviour with regard to both metabolism and gene expression.

COMP04. Identify and analyse the physical and chemical properties of matter and how its structure determines its reactivity and function.

COMP06. Develop the skills needed to use the most common equipment, instruments and basic techniques in biotechnology, following quality standards and current biosecurity regulations.

COMP11. Interpret how genetic and metabolic regulation can adapt to physiological and/or pathological changes.

4. CONTENTS

- Structure of the main carbohydrates: monosaccharides, disaccharides, polysaccharides, glycoproteins and mucopolysaccharides.
- Structure of lipids. Digestion, absorption and plasma lipid transport.
- Structure of amino acids and proteins. Denaturation of proteins.
- Enzymes. Kinetics of enzymatic reactions. Enzymatic inhibition and its regulation.
- Structure and functions of nucleotides, RNA and DNA. Replication, transcription and processing of RNA.
- Metabolism of carbohydrates and its regulation.
- Metabolism of lipids.
- Synthesis and degradation of proteins.
- Metabolism of nucleic acids: pathways of biosynthesis and degradation of nucleotide.
- Introduction to DNA recombination techniques.

In order to develop these objectives, the course has been structured in two didactic blocks that include the different topics:

Block I. Structure and function of the main biomolecules.

- **Topic 1**. General principles of biochemistry.
- **Topic 2**. Structure, classification and properties of carbohydrates.
- **Topic 3**. Structure, classification and properties of lipids.
  Structure, properties and function of nucleotides and nucleic acids.
- **Topic 5**. Structure and properties of amino acids and proteins.
- **Topic 6**. Enzymes and enzyme catalysis.

Block II: Metabolism

- **Topic 7.** Fundamentals of bioenergetics and thermodynamics.
- **Topic 8.** Metabolism of carbohydrates.
- **Topic 10.** Metabolism of fatty acids.
- **Topic 11.** Protein metabolism
- **Topic 12.** Nucleotide metabolism: biosynthesis and degradation of nucleotides.
- **Topic 13.** Integration of metabolism in different nutritional states.

5. TEACHING/LEARNING METHODS

The types of teaching/learning methods are as follows:

- Lecture.
- Collaborative learning.
- Problem-based learning.
- Learning based on workshop teaching.
- IBL: Inquiry-based learning.

6. LEARNING ACTIVITIES

The types of learning activities, plus the amount of time spent on each activity, are as follows:

On campus:

Learning activity	Number of hours
Lectures	60
Asynchronous master lectures	17
Debates and discussions	4
Spoken presentations	5
Written reports and essays	18
Tutorials	20
Independent working	75
Workshops and/or lab work	10
Research (scientific/case studies) and projects	6
On-campus knowledge tests	10
TOTAL	**225**

7. ASSESSMENT

The assessment methods, together with how much they each count towards the final grade for the subject area, are as follows:

On campus:

Assessment system	Weight
On-campus knowledge tests	60%
Spoken presentations	5%

Reports and written work	15%
Case study/problem scenario	5%
Laboratory work	15%

On the Virtual Campus, when you open the subject area, you can see all the details of your assessment activities and the deadlines and assessment procedures for each activity.

7.1. Ordinary exam period

To pass the subject area in the ordinary exam period you must obtain a mark of 5.0 or more out of 10.0 in all assessed parts of the subject. Any part you do not pass in the ordinary exam period will need to be recovered in the extraordinary exam period (resits).
Your final grade will be the average of the partial marks in each of the learning activities you have passed.
The continuous assessment system for the learning activities requires attendance to at least 50% of the classes.

It is compulsory for students to accredit attendance to at least 50% of classes. This requirement is essential to the assessment process and qualifies students for the right to obtain academic counselling, support and monitoring from the professor. To this end, students must use the technological means made available by the University to accredit their daily attendance to each of their classes. This system will also serve to guarantee an objective record of the active role of the students in the classroom. Failure to accredit attendance to at least 50% of the classes by any of the means proposed by the University will mean that the professor awarding a fail to the student for that subject area in the ordinary exam period in accordance with the grading system outlined in these regulations. All of the above, without prejudice to the other requirements or higher attendance percentages that other faculties may stipulate in their learning guides or internal regulations. Regulations for the assessment of official degree programmes, Art. 1 point 4. (http://www.uem.es/myfiles/pageposts/reglamento_evaluacion_titulaciones_oficiales_grado.pdf).

7.2. Extraordinary exam period (resits)

To pass the subject area in the extraordinary exam period (resits), the students must obtain a mark equal to or above 5.0 out of 10.0 in all parts of the subject assessment they did not pass during the ordinary exam period.

The student must submit the activities not passed in the ordinary exam period taking into account the corrections or comments made by the teacher. The student must also submit any activities which were not submitted.

The final grade will be the average of the partial marks in each of the activities passed (with a mark equal to or higher than 5 out of 10). The marks for the assessable activities the student passed in the ordinary exam period will be maintained for calculating this grade.

8. TIMELINE

The timeline with delivery dates of assessable activities in the subject area is indicated in this section:

Assessable activities	Date
On-campus knowledge tests	1st Partial test (week 13 or 14 in S1); 2nd Partial test (week 19 or 20 in S2)
Reports and written work	Throughout the whole course
Case study/problem: Inquiry-based learning (IBL)	During S2
Oral presentation	Week 16 (S2)
Laboratory practice	Weeks 1-10 in S2 (depending on group)

The timeline may be subject to modifications for logistical reasons of the activities. Students will be informed of any changes in due time and course.

9. BIBLIOGRAPHY

The reference work for following this subject area is:

- Lehninger. *Principios de Bioquímica*, 8ª Ed. D.L. Nelson y M. M. Cox. Ediciones Omega, S.A. 2021.
- Feduchi E, et al. Bioquímica. Conceptos esenciales. Ed. Panamericana, 4a ed., 2025.

The recommended bibliography is indicated below:

- De Voet J.G. y Pratt C.W. Fundamentos de Bioquímica. La vida a nivel molecular. 4ª Ed. 2016.
- Mathews y Van Holde. Bioquímica, 3ª Ed. McGraw-Hill. Interamericana. 2002
- Stryer, Berg y Tymoczko. Bioquímica, 5ª Ed. Editorial Reverté, S.A. 2003.
- Bioquímica clínica, 7ª Ed. W.J. Marshall, S.K. Bangert y M. Lapsley 2013.
- Bioquímica Médica básica, 4ª Ed. M. Lieberman, A.D. Marks 2012.
- B. Alberts, D. Bray, K. Hopkin, A. Johnson, J. Lewis, M. Raff, K. Roberts, P. Walter. Introducción a la Biología Celular. 3ª Ed. Ed Panamericana. 2011.
- Alberts, A. Johnson, J. Lewis, D. Morgan, M. Raff, K. Roberts, P. Walter "Molecular Biology of the Cell" 6ª Ed., 2014.

10. EDUCATIONAL GUIDANCE AND DIVERSITY UNIT

The Educational Guidance and Diversity Unit (ODI in Spanish) offers support throughout your time at university to help you with your academic achievement. Other cornerstones of our educational policy are the inclusion of students with special educational needs, universal access in all our university campuses and equal opportunities.

This ODI unit offers students:

1. Support and monitoring through counselling and personalised student plans for those who need to improve their academic performance.
2. Curricular adaptations to uphold diversity, with assistance for those students who require specific educational support, leading to equal opportunities without significant changes to methodology or evaluation.
3. We offer students a range of extracurricular educational resources to reinforce skills which will enhance their personal and professional development.
4. Career guidance by offering tools and advice to students with doubts regarding their professional careers or those who believe they have chosen the wrong line of study.

Students who need educational support can contact us at:
orientacioneducativa@universidadeuropea.es

11. SATISFACTION SURVEYS

Your opinion matters!

Universidad Europea encourages you to complete our satisfaction surveys to identify strengths and areas for improvement for staff, degree courses and the learning process.

These surveys will be available in the surveys area of your virtual campus or by email.

Your opinion is essential to improve the quality of the course.

Many thanks for taking part.

WORK PLAN OF THE SUBJECT

HOW TO COMMUNICATE WITH YOUR TEACHER

When you have a question about content or activities, don't forget to post it in your subject forums so that all your classmates can read it.

It's possible that someone else has the same question as you!

If you have a question exclusively addressed to the teacher, you can send him/her a private message from the Virtual Campus. Also, if you need to go deeper into a subject, you can arrange a tutorial.

It is advisable that you regularly read the messages sent by students and teachers, as they are another way of learning.

SCHEDULE OF ACTIVITIES

In this section you will find the schedule of training activities, as well as the dates of delivery of the evaluable activities of the course:

Week	Contents	Assessable Activities	Weight in the assessment of the assessable activity
1-14 (S1)	Block I. Structure and function of the main biomolecules.	Lectures and written reports and essays	7,5%
1-16 (S2)	Block II: Metabolism	Lectures and written reports and essays	7,5%
13	Block I. Structure and function of the main biomolecules.	Interim exam: first on-campus knowledge test	30%
19-20	Block II: Metabolism	Exam: second on-campus knowledge test	30%
1-10 (S2)	Laboratory practices	Laboratory practices	15%
10 (S2)	First delivery IBL	Case study/problem and oral presentation	-
15 (S2)	Final delivery IBL	Case study/problem and oral presentation	5%
16 (S2)	Presentation IBL project	Case study/problem and oral presentation	5%

This timetable may be subject to modifications, which will be notified to the student in due time and form.

DESCRIPTION OF ASSESSMENT ACTIVITIES

Activity 1. On-campus knowledge test (60 %).

- There will be two objective knowledge tests (first part-time and second part-time). Each of them will account for 30% of the final grade of the subject.
- In order to pass each test, a mark equal to or higher than 5.0 out of 10.0 must be obtained in each one.
- In case of failing the first partial exam, the student will have the option to make it up on the same day as the second partial exam. The recovery of the first mid-term will consist of an exercise of identical characteristics to the first initial mid-term.
- In order to maintain the integrative capacity of the students and the continuous assessment, the second test may contain 10% of the basic contents included in the first test. The knowledge test may include questions on concepts studied in the evaluable activities and in the laboratory practicals.

Activity 2. Laboratory practicals (15 %).

- The objective of the laboratory practice is for students to acquire the skills of scientific research methods, handling of instruments and equipment, as well as to acquire practical and active knowledge about the main concepts of the subject, through experimentation.
- The theoretical contents and work guidelines for each practical will be provided to the student in the form of a notebook, which will be available on the Virtual Campus before the practical is carried out. The student will have to prepare the script for each session and the corresponding theoretical basis beforehand.
- It is essential to arrive 5-10 minutes before the start of the practice session. It is compulsory to bring a lab coat and lab script.
- Each practical will be assessed by means of an individual multiple-choice questionnaire, carried out at the end of the work (10% of the final mark), in addition to submitting the completed workbook on the university's Virtual Campus (5% of the final mark), within the deadlines proposed by the lecturer. In order to pass this section, it is necessary to obtain a grade equal to or higher than 5.0 out of 10.0 in the average mark obtained in the 5 practical sessions carried out during the academic year.
- All practical sessions in the laboratory are compulsory: failure to attend any of them will result in failure of this section and, consequently, of the subject.
- Students must be present in the laboratories of the Universidad Europea de Madrid to carry out this activity. The requirements for access to the evaluation are: attendance in the laboratory and uploading the completed laboratory notebook to the Virtual Campus.
- For the correct development of the laboratory practices, it is essential in all cases: o Compliance with the regulations concerning PPE (personal protective equipment).
- Attendance on time (with a 5-10 min margin), with the lab coat fastened, appropriate shoes (closed) and hair tied up.

Activity 3. Reports and written work (15 %).

- This section includes all individual productions proposed to students throughout the course, to be carried out as part of the autonomous work. These activities aim to reinforce important concepts that have been previously worked on from a theoretical point of view.
- In order to pass this section, students must obtain an average mark of 5.0 points out of 10.0 out of 10.0 for all the proposed evaluable activities.
- The dates of these activities will be communicated by the teacher sufficiently in advance, in the classroom and by means of an announcement on the Virtual Campus.
- The different activities will be available on the Virtual Campus, as well as the assessment rubrics specifically designed for each activity of this subject.

Activity 4: Case/problem resolution and oral presentations: IBL project (10%):

- The IBL project consists of a biotechnological idea or process aimed at solving problems or demands of society in the health, environmental, industrial, etc. fields. This idea will be developed throughout the first two years of the degree, through different subjects. In the second year, students will produce a poster that brings together all the knowledge acquired in the 6 subjects involved and will be presented at the 'Conference on pharmaceutical, biomedical and biotechnological research' of the Department of Pharmacy and Biotechnology. In this subject the students will develop the project from the perspective of Biochemistry.
- The activity consists of preparing an infographic that will later be presented to the rest of the class. There will be two class sessions (4 hours in total, compulsory) in which the students will present their ideas and progress in the project to the teacher.
- The communication channel for this activity between students will be through Teams.
- All reports will be evaluated using plagiarism detection tools (Turnitin). Excessive plagiarism (>20%) will result in failure of the project as well as the course.
- All detailed information will be available on the Virtual Campus in the learning module 'IBL project'.

RUBRICS FOR ASSESSABLE ACTIVITIES

Activity 1. Knowledge tests

The multiple-choice questions have 4 options and only one correct answer. Wrong answers will subtract 1/3 of a correct answer. The short questions will not be penalised.

Activity 2. Laboratory practicals

The laboratory practicals are assessed by means of an individual multiple-choice questionnaire (10% of the final mark), in addition to submitting the laboratory notebook with the answers to the questions posed in the practical script (5% of the final mark). The laboratory notebook will be assessed out of 10 points based on the teacher's answer sheet, where the correct answer to each question will be indicated, as well as the score for each section.

Activity 3. Reports and written papers

The activities will be assessed out of 10 points based on the teacher's answer sheet, where the correct answer to each question will be indicated, as well as the score for each section.

All reports will be evaluated using plagiarism detection tools (Turnitin). An excessive percentage of plagiarism (>20%) will result in failure of the activity and of the subject.

Activity 4: Case/problem resolution and oral presentations (IBL project):

The IBL project represents 10% of the final mark for the subject, of which 4% corresponds to the content of the work presented, 1% corresponds to the average mark obtained in the self-evaluation and co-evaluation of the group work and 5% corresponds to the oral presentation.

The contents will be assessed according to the following rubric (as a group):

Note	0-5	5-7	7-9	9-10

Content (30%)	The work does not include the necessary content to develop the subject matter. It is not related to biochemical aspects.	The contents are appropriate, but are stated in a vague or ambiguous manner. Related to a biochemical aspect.	The contents are well presented and are in line with the subject matter. Related to two biochemical aspects.	The contents are well presented and facilitate the understanding of the subject matter. Related to three or more biochemical aspects.
Application of knowledge (10%)	He/she is not able to retrieve the knowledge acquired in class and not able to apply it to a practical case.	Is able to partially retrieve knowledge acquired in class, but not to apply it to a practical case.	Is able to retrieve knowledge acquired in class, but not to apply it to a practical case.	Is able to retrieve the knowledge acquired in class to apply it to a practical case.
Material used for the presentation (20%)	Poor infographics. It is poorly designed and does not support the presentation. Figures and diagrams are not used.	Infographics could be improved. It does not follow a design that facilitates understanding of the subject matter. Figures and diagrams could be improved.	The infographic is correct, although it lacks originality.	Well-designed infographics are original and enhance the clarity of the presentation.
Vocabulary in writing (10%)	The wording does not allow the work to be understood. They use inappropriate vocabulary.	The wording could be improved, as it hinders the understanding of the work.	The writing allows for an understanding of the work. They use vocabulary appropriate to the topic.	The writing facilitates the understanding of the work. They use appropriate scientific and technical vocabulary.
Quality of the assignment (structure and format) (10%)	They submit homework that is incomplete, disorganised and does not correspond to what has been asked for.	They present the task as poorly organised and incompletely structured.	They present the task with quality, it is organised and structured almost completely.	They present a high quality task, it is organised and the structure is complete.
Teamwork (10%)	Very little group cohesion. The members work in a disorganised and uncoordinated way.	Poor group cohesion. One component is the one who performs and leads the presentation of the work.	Group cohesion. Most members of the group participate and collaborate.	Great cohesion of the group. All members of the group are very participative and cooperative.
Biography (10%)	References and bibliography not up to date and inadequate.	The bibliography is limited (less than 3 scientific sources) and not well referenced.	Adequate and up-to-date bibliography (between 3 and 6 scientific sources) and is well referenced.	Adequate and up-to-date bibliography (6 or more bibliographic sources) and is well referenced.

The oral presentation will be assessed according to the following rubric (individually):

Note	0-5	5-7	7-9	9-10
Oral presentation (40%)	The student presents the content of the infographic verbatim. The presentation is made with abrupt jumps. Vocabulary, gestures and intonation are inappropriate. Time is not kept.	Vocabulary sparse, gestures and intonation adequate only at some points. Fairly close to the allotted time.	The pupil addresses himself/herself to the rest of his/her classmates. Vocabulary, intonation and gestures are appropriate most of the time. Adheres to the allotted time.	The learner is fluent and confident in presentation, addressing his/her classmates and maintaining their attention. Appropriate vocabulary, gestures and intonation. S/he keeps to the allotted time.
Knowledge (40%)	The student does not master the subject and does not answer the questions.	The student partially masters the topic and answers the questions ambiguously.	The learner masters the topic and answers questions appropriately.	The student masters the subject completely and answers all questions in a clear and well-argued way.
Consistency in presentation (20%)	The narrative is disorganised, ideas are repeated and mixed. There is no homogeneity between the different sections.	The narrative is organised, but it is incomplete, some ideas are mixed up, making it difficult to understand. There is a certain homogeneity between the different sections.	The narrative is organised and reasonably complete. Although some ideas are jumbled, it does not hinder comprehension. There is homogeneity between sections, with introduction and conclusion of ideas.	The narrative is very well organised and comprehensive. Ideas are presented in a clear and understandable way, using visual resources and examples. There is homogeneity between sections, with introduction and conclusion of ideas.

- Students who raise questions of interest after the oral presentation of a group will receive an extra point in the final evaluation of this activity (up to a maximum of 10).
- In addition, each student must carry out their own self-evaluation and the evaluation of the rest of their group mates. This information will be reserved and confidential between the student and the teacher. The 1% of each student's IBL mark will be the average of all the marks obtained (their own and those of their group mates). The rubric will be available on the Virtual Campus in the learning module 'IBL project'. If the difference between the self-assessment grade is equal to or greater than 20% of the grade awarded by the other members of the group, the student will fail the course in the ordinary exam and will have to sit the extraordinary exam. The maximum mark that will appear in the minutes of the ordinary exam will be 4.0 out of 10.0.

PLAGIARISM REGULATIONS

In accordance with the disciplinary regulations for students of the Universidad Europea:

- Plagiarism, in whole or in part, of intellectual works of any kind is considered a very serious offence.
- Very serious offences relating to plagiarism and the use of fraudulent means to pass the assessment tests will result in the loss of the corresponding exam session, as well as the reflection of the offence and the reason for it in the academic transcript.